SEEDLING DISEASE CONTROL: INDUCTION OF PHYTOALEXIN SYNTHESIS IN COTTON BY BIOCONTROL AGENTS

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Abstract

The mechanisms involved in the biocontrol of cotton seedling diseases by *Trichoderma virens* has been the subject of investigation for many years. The production of mutants of *T. virens* deficient for mycoparasitism and antibiotic synthesis has shown that neither mechanism is vital for biocontrol efficacy. Recent evidence, however, indicates that the biocontrol agent may function by stimulating cotton roots to synthesize antifungal phytoalexins. HPLC analyses of extracts of excised roots from cotton seedlings grown in sterile vermiculite after seed treatment with a wheat bran/peat moss control or air-dried preparations of *T. virens* gave the following results: Extracts of control roots yielded only small quantities of phytoalexins, whereas those treated with *T. virens* preparations were stimulated to synthesize much higher concentrations of hemigossypol (HG), desoxyhemigossypol (dHG) and gossypol (G). When these compounds were assayed for toxicity to the seedling pathogen *Rhizoctonia solani*, all three proved to be fungicidal. The most toxic was dHG with an LD 100 of 5 μg ml^{-1}, followed by HG (10 μg ml^{-1}) and G (30 μg ml^{-1}). A comparison of biocontrol-effective and noneffective strains of *T. virens* for stimulation of phytoalexin synthesis in cotton roots, showed that strains with no biocontrol activity had little effect on phytoalexin production. Strains showing good biocontrol efficacy stimulated high levels of phytoalexin synthesis in treated roots. These results indicate that stimulation of phytoalexin synthesis, and perhaps the entire resistance system, in the host plant by seed treatments with *T. virens* prior to infection by seedling disease pathogens may be the principal mechanism in seedling disease control.

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